

Pulse Oximetry

Pulse oximetry is a way to measure how much oxygen your blood is carrying. By using a small device called a *pulse oximeter*, your blood oxygen level can be checked without needing to be stuck with a needle. The blood oxygen level measured with an oximeter is called your *oxygen saturation* level (abbreviated $O_2\text{sat}$ or SaO_2). This is a percentage of how much oxygen your blood is carrying compared to the maximum it is *capable* of carrying. Normally, more than 89% of your red blood should be carrying oxygen.



Why is it important to have my blood oxygen level checked?

If you have a lung disease, your blood oxygen level may be lower than normal. This is important to know because when your oxygen level is low, the cells in your body can have a hard time working properly. Oxygen is the “gas” that makes your body “go,” and if you are low on “gas,” your body does not run smoothly. Having a very low blood oxygen level also can put a strain on your heart and brain.

Most people need an oxygen saturation level of at least 89% to keep their cells healthy. Having an oxygen level lower than this for a short time is not believed to cause damage. However, your cells can be strained or damaged if low oxygen levels happen many times. If your oxygen level is low on room air, you may be asked to use *supplemental* (extra) oxygen. The oximeter can be used to help see how much oxygen you need and when you may need it. For example, some people need more oxygen when asleep than when awake. Some need more oxygen with activity than when at rest. (See ATS Patient Information Series on “Oxygen Therapy” and “Oxygen Therapy for Children”)

How does a pulse oximeter work?

A pulse oximeter comes either as a small unit with a built in finger/toe clip, or a small hand held device that has a wire probe that can attach or be applied to your finger, toe or earlobe. The small unit is less expensive and more practical for home use.

Beams of light from the device pass through the blood in your finger (earlobe or toe) to measure your oxygen. You will not feel this happen. The beams of light are “read” to calculate the percentage of your blood that

is carrying oxygen. It also provides a reading of your heart rate (pulse). To make sure the oximeter is giving you a good reading, count your pulse for one minute and compare the number you get to the pulse number on the oximeter. If they are the same, you are getting a good signal.

Should I get a pulse oximeter?

Most people do not normally need a pulse oximeter, though during the COVID-19 pandemic, many people are using them to check their oxygen levels. Some people are prescribed a pulse oximeter if they have or could have periods of low oxygen; for example, when you are exercising or if you travel to high altitude. Having a pulse oximeter in these cases will allow you to monitor your blood oxygen level and know when you need to increase your supplemental oxygen flow rate. Ask your healthcare provider what oxygen saturation number(s) they want you to maintain.

Pulse oximeters are available online or by prescription from your local pharmacy or medical supply company. In some cases, your insurance company will cover the cost of a pulse oximeter.

What is the difference between the oxygen information reported from an oximeter versus from an arterial blood gas?

An oximeter *indirectly* measures the amount of oxygen that is carried by your blood. An arterial blood gas (ABG) *directly* measures both the amount of oxygen carried by your blood and the actual amount of gases (oxygen and carbon dioxide) that are in your blood. To get an ABG, blood is taken directly out of your artery (usually from the wrist) and can be painful. Oximetry is painless but is not

as accurate as an ABG. Also, a pulse oximeter does not measure your carbon dioxide level.

How accurate is the pulse oximeter?

The oxygen level from a pulse oximeter is reasonably accurate. Most oximeters give a reading 2% over or 2% under what your saturation would be if obtained by an arterial blood gas. For example, if your oxygen saturation reads 92% on the pulse oximeter, it may be actually anywhere from 90 to 94%. To get a good reading, you need to allow some time (a few seconds) for the pulse oximeter to capture your pulsations adequately.

There are many factors that can reduce the accuracy of a pulse oximetry reading, including:

- Your hands are cold
- You are not holding still
- You are wearing nail polish (especially black, blue or green)
- You are wearing artificial nails
- Your oxygen saturation is very low (below 80%)
- Your skin is thicker than normal
- Skin pigment can also impact the accuracy of pulse oximetry. Recent studies show that in those with darker skin pigments, pulse oximetry may miss below-normal oxygen saturations. If you have a darker skin tone, ask your provider about the accuracy of your oximetry readings.
- If you smoke, the reading on your oximeter may be higher than your actual oxygen saturation. This is because smoking increases carbon monoxide levels in your blood, and the oximeter cannot tell the difference between the gas carbon monoxide from oxygen.

Always discuss your oximeter results with your providers to check if they make sense, and what to do with the information before making any medical decisions.

When should I use a pulse oximeter?

If you have been prescribed an oximeter by your healthcare provider, ask them when they want you to use the oximeter to monitor your blood oxygen level. Ask your healthcare provider when you should change the flow rate on your supplemental oxygen and at what reading you should seek medical attention.

Times when an oximeter reading may be helpful are:

- When you are first prescribed oxygen. This helps your healthcare provider know if and how your oxygen saturation levels change when doing activities at home.
- During or just after exercising. Your body, like your car, needs more oxygen (“gas”) when you are moving. Your oxygen saturation might be checked during activity to see if you have low oxygen that might not be an issue at rest. Your healthcare provider will decide with you

what to do if you have oxygen problems with exercise.

- If you are flying or traveling to a high altitude location, as your supplemental oxygen needs may increase during these times.

How can I get the best reading from my pulse oximeter?

Your pulse oximeter measures your oxygen saturation, or percentage of blood carrying oxygen. To get the best reading from your oximeter, you need to make sure enough blood is flowing to the hand and finger wearing the device. The best reading, therefore, is achieved when your hand is warm, relaxed, and held below the level of your heart.

If you are following this guidance and your pulse oximeter seems to be providing inaccurate readings, there could be a problem with the probe. You can bring your oximeter to your healthcare provider’s office or equipment company to have it checked against theirs for accuracy.

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Rx Action Steps

- ✓ Ask your health care provider to show you how to use your oximeter to get the best readings. Be sure your hand is warm and probe fits well.
- ✓ Ask your healthcare provider when you should use your oximeter.
- ✓ Ask your healthcare provider when you should turn up or turn down your supplemental oxygen and when to call with low readings.
- ✓ Do not smoke.

Healthcare Provider’s Contact Number:

Other Resources:

American Thoracic Society

www.thoracic.org/patients

American Lung Association

<https://www.lung.org/lung-health-diseases/lung-procedures-and-tests/pulse-oximetry>

Pulse Ox Info

<http://www.pulseox.info/pulseox/what.htm>

British Lung Foundation

<https://www.blf.org.uk/support-for-you/breathing-tests/tests-measure-oxygen-levels>

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